5.18 Cultural Resources

5.18.1 Introduction

Reservoir operations have the potential to result in both direct and indirect impacts on historic properties (archaeological sites and historic structures). The primary direct impact of reservoir operations on historic properties, in particular on archaeological sites, is soil erosion by rainfall, streamflow, and wave action from wind and recreational boat traffic. Another direct impact is exposure by elevation fluctuations that result in saturation or alternate saturation/drying of archaeological deposits and historic structures. Indirect impacts include development of the shoreline and back-lying lands, changes to the view shed, and looting/vandalism or disturbance from recreational activity at historic properties. To address these concerns, the analyses of three other resource areas (Shoreline Erosion, Shoreline Development and Land Use, and Visual Resources) were used in conjunction with a quantitative assessment of known historic property location data.

5.18.2 Impact Assessment Methods

The Shoreline Erosion analysis evaluated the potential for a change in erosion, which can disturb or destroy intact archaeological deposits—resulting in a loss of site integrity and adversely affecting site significance (i.e., its eligibility for listing in the NRHP). Three erosion zones concern historic properties: the summer pool shoreline, the winter pool drawdown, and the tailwater streambanks. Alternatives with greater potential for erosion along the shoreline and streambanks were considered to be adverse for historic properties. Conversely, alternatives that may reduce erosion in those areas were expected to be beneficial for historic properties. Alternatives with longer durations at summer pool elevation decrease erosion in the winter pool drawdown zone and were considered beneficial for historic properties in those areas.

Results of the Land Use analysis were included in the assessment because of the relationship between shoreline development and the destruction of archaeological sites and historic structures and landscapes. Alternatives with higher water levels for longer periods of time encourage shoreline development. These alternatives are anticipated to result in the most adverse impact on historic properties, while alternatives with lower water levels for longer periods of time are expected to have less impact.

Results of the Visual Resources studies were included because scenic integrity or attractiveness can promote development, and development can adversely affect historic properties. Alternatives that would result in less overall fluctuation in pool levels would improve scenic integrity and overall scenic attractiveness, and are anticipated to result in the most adverse impact on historic properties.

In addition to the results of these three analyses, a quantitative assessment of the number of archaeological sites located between summer pool and winter pool at each reservoir was used to rank the alternatives (Table 5.18-01). Historic properties located in the winter pool drawdown

are directly affected by reservoir operations through saturation and drying of archaeological materials and erosion of historic foundations. Indirectly, they are affected by site vandalism and looting or disturbance from recreational activity. Except for the Commercial Navigation Alternative, under all alternatives fewer archaeological sites would be located in the drawdown. Consequently, the project effects for these alternatives would be decreased compared to the Base Case. The number of archaeological sites below pool, at summer pool, and from summer pool to 2 km above summer pool was the same for all alternatives and therefore has no comparative value.

Table 5.18-01 NRHP Archaeological Sites by Zone and Policy Alternative

Zone	Alternative							
	Base Case	Reservoir Recreation A	Reservoir Recreation B	Summer Hydro-power	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat
Below pool	74	290	495	391	293	74	442	529
Between winter pool and summer pool	1,400	1,184	979	1,083	1,181	1,400	1,032	945
At summer pool	75	75	75	75	75	75	75	75
Summer pool to 2 km above summer pool	235	235	235	235	235	235	235	235
Total	**1,784**	**1,786**	**1,787**	**1,788**	**1,789**	**1,790**	**1,791**	**1,792**

The anticipated impacts for the Base Case and each of the policy alternatives are discussed in the following sections.

5.18.3 Base Case

Shoreline Erosion. The Base Case would result in continued erosion of reservoir shorelines and tailwater streambanks.

Exposure by Elevation Fluctuations. The largest number of NRHP-eligible archaeological sites would be located between summer and winter pools under the Base Case and the Commercial Navigation Alternative.

Land Development. Under the Base Case, reservoir elevations and drawdown schedules would not change. Development of the mainstem and tributary reservoir shorelines would continue at the same rate.

Visual Impacts. The existing scenic integrity would continue; changes in viewsheds would be related to continued trends in increased shoreline development and continued erosion.

5.18.4 Reservoir Recreation Alternative A

Shoreline Erosion. Longer duration at full summer pool levels and an increase in recreational boating under Reservoir Recreation Alternative A would increase existing erosion along the full summer pool shoreline. Longer durations at full summer pool would decrease runoff erosion in the drawdown. Longer durations at summer pool levels would accelerate the slope of the drawdown, which would more often result in higher flows in tailwaters and increase erosion along tailwater streambanks.

Exposure by Elevation Fluctuations. Reservoir Recreation Alternative A has 1,184 NRHP-eligible archaeological sites located between summer and winter pool elevations. This alternative would slightly decrease the number of archaeological sites in the drawdown that are exposed to saturation and drying compared to the Base Case. Indirectly, this alternative would slightly decrease impacts from exposure to vandalism, looting, and disturbance from recreational activity.

Land Development. Reduced summer pool drawdowns and higher winter pools under Reservoir Recreation Alternative A could induce a slight acceleration in the rate of development, which would increase impacts on historic properties.

Visual Impacts. Reservoir Recreation Alternative A would moderately improve scenic integrity because of less overall fluctuations in pool levels and generally higher pool levels. Improvements to visual integrity could encourage development, which is anticipated to increase impacts on historic properties.

5.18.5 Reservoir Recreation Alternative B and Tailwater Recreation Alternative

Shoreline Erosion. Reservoir Recreation Alternative B would increase the duration at full summer pool levels and would result in increased boat activity. These changes would cause increased erosion at summer pool elevations but may decrease erosion in the winter pool drawdown zone. The Tailwater Recreation Alternative would also result in increased summer pool erosion but not to the same degree as under Reservoir Recreation Alternative B. Longer periods at higher flows would increase erosion along tailwater streambanks under Reservoir Recreation Alternative B, but erosion in the tailwaters under the Tailwater Recreation Alternative would not be substantially changed from that under the Base Case.

Exposure by Elevation Fluctuations. Reservoir Recreation Alternative B and the Tailwater Recreation Alternative have 979 and 1,032 NRHP-eligible archaeological sites, respectively, located between summer and winter pool elevations. They have the second and third lowest number of archaeological sites that can be exposed the changing water levels. These alternatives would reduce the number of sites in the drawdown that are exposed to saturation and drying compared to the Base Case. Indirectly, this alternative would decrease the effects

resulting from exposure to vandalism, looting, and disturbance from recreational activity because fewer sites would be exposed.

Land Development. Reservoir Recreation Alternative B and the Tailwater Recreation Alternative are expected to increase the rate of open space development. An increase in development would increase impacts on historic structures and archaeological sites.

Visual Impacts. Under Reservoir Recreation Alternative B and the Tailwater Recreation Alternative, there would be an overall much greater reduction in pool level fluctuations, longer duration of pool levels at higher elevations, and higher winter pool levels. These alternatives would provide the greatest improvement of scenic integrity. Improvement to visual integrity could encourage development, which is anticipated to increase impacts on historic properties.

5.18.6 Summer Hydropower Alternative

Shoreline Erosion. Shorter periods of full summer pool levels under the Summer Hydropower Alternative would decrease existing erosion. Earlier drawdowns would result in shorter periods at higher flows and less erosion of the shoreline and tailwater streambanks. Longer periods of winter drawdown would increase runoff erosion in the drawdown.

Exposure by Elevation Fluctuations. The Summer Hydropower Alternative has 1,083 NRHP-eligible archaeological sites located between summer and winter pool elevations. This alternative would slightly decrease the number of archaeological sites and historic structures in the drawdown that are exposed to saturation and drying compared to the Base Case. Indirectly, this alternative would slightly decrease the effects resulting from exposure to vandalism, looting, and disturbance from recreational activity.

Land Development. Increased summer drawdowns under the Summer Hydropower Alternative could slow the rate of land use conversion. A decrease in development would decrease impacts on historic properties.

Visual Impacts. Under the Summer Hydropower Alternative, the overall reduction of the duration when pool levels are at higher levels would slightly decrease scenic integrity and may reduce the rate of development, which would decrease impacts on historic properties.

5.18.7 Equalized Summer/Winter Flood Risk Alternative

Shoreline Erosion. Shorter reservoir pool durations at summer levels and a smaller drawdown zone affected by rainfall would result in less erosion and would decrease impacts on historic properties in these areas. Longer periods of winter drawdown may increase erosion in the winter pool drawdown zone and may increase impacts on historic properties located in the drawdown.

Exposure by Elevation Fluctuations. The Equalized Summer/Winter Flood Risk Alternative has 1,181 NRHP-eligible archaeological sites located between summer and winter pool elevations.

This alternative would slightly reduce the number of archaeological sites and historic structures in the drawdown that are exposed to saturation and drying compared to the Base Case. Indirectly, slightly fewer sites under this alternative would be exposed to vandalism, looting, and disturbance from recreational activity, compared to the Base Case.

Land Development. The Equalized Summer/Winter Flood Risk Alternative could accelerate the rate of development, which would increase impacts on historic properties.

Visual Impacts. The Equalized Summer/Winter Flood Risk Alternative would reduce elevation fluctuations and maximum reservoir levels would be lower. Low water levels might decrease the scenic integrity of the shoreline and reduce development, which could decrease impacts on historic properties.

5.18.8 Commercial Navigation Alternative

Shoreline Erosion. The Commercial Navigation Alternative would result in continued erosion of reservoir shorelines and tailwater streambanks similar to the Base Case.

Exposure by Elevation Fluctuations. The Commercial Navigation Alternative, along with the Base Case, has the largest number of NRHP-eligible archaeological sites located between summer and winter pool elevations. The effects of site exposure would be the same as the Base Case.

Land Development. Reservoir elevations and drawdown schedules would not change under the Commercial Navigation Alternative, resulting in continued development of the shorelines on mainstem and tributary reservoirs.

Visual Impacts. Scenic integrity would be slightly improved under the Commercial Navigation Alternative, primarily for the mainstem reservoirs. Mainstem reservoirs would have less pool level fluctuations. Tributary reservoirs would be the same as under the Base Case. Slightly improved scenic integrity along the mainstem reservoirs could affect shoreline development and might slightly increase impacts on historic properties.

5.18.9 Tailwater Habitat Alternative

Shoreline Erosion. Summer levels would be at high elevations for longer durations than under the Base Case, resulting in more erosion. Reservoir releases would generally be at higher flows for longer durations than under the Base Case, resulting in increased erosion.

Exposure by Elevation Fluctuations. The Tailwater Habitat Alternative has 945 NRHP-eligible archaeological sites located between summer and winter pool elevations. This alternative has the fewest number of sites in the area that would be affected by changing water levels and would decrease the number of archaeological sites and historic structures in the drawdown that would be exposed to saturation and drying compared to the Base Case. Indirectly, this

alternative would decrease the effects resulting from exposure to vandalism, looting, and disturbance from recreational activity.

Land Development. The Tailwater Habitat Alternative could induce acceleration in the rate of development around affected reservoirs, which would increase impacts on historic properties.

Visual Impacts. The Tailwater Habitat Alternative generally would provide the longest duration of high pool elevations of all the alternatives. The greatly increased scenic integrity under this alternative could promote development, which would increase impacts on historic properties.

5.18.10 Summary of Impacts

All alternatives, including the Base Case, would result in adverse impacts on NRHP-eligible archaeological sites and historic structures through erosion from rainfall, streamflow, and wave action resulting from wind and recreational boat traffic. Another direct impact under all alternatives is the exposure of archaeological deposits and historic structures to saturation and drying in the drawdown zone.

Changes in the existing reservoir operations policy could affect archaeological sites and historic structures indirectly. These impacts include exposure of historic properties in the drawdown to vandalism, looting, and disturbance from recreational activity. Other indirect impacts are development along the shoreline and in back-lying lands, and changes to visual or scenic integrity that may influence development.

Considering the relative consequences and impacts of potential effects related to the policy alternatives, a ranking based on an increase or decrease of effects compared to the Base Case was derived (Table 5.18.02).

The Base Case would result in adverse effects on historic properties, as discussed in Section 4.18. All the policy alternatives would continue to adversely affect historic properties. Compared to the Base Case, the Commercial Navigation Alternative would result in little or no change to ongoing impacts. The Summer Hydropower Alternative would decrease direct and indirect impacts, resulting in a slight benefit for historic properties compared to the Base Case. The remaining five policy alternatives would increase direct and indirect impacts on historic properties and were considered slightly adverse to adverse.

5.18-02 Relative Ranking of Impacts by Policy Alternative

Alternative	Direct Effects					Indirect Effects			
	Soil Erosion[1]			Exposure by Elevation Fluctuations[2]	Overall Ranking of Direct Effects[3]	Shoreline and Back-Lying Land Development[4]	Visual Impacts	Exposure by Elevation Fluctuations[2]	Overall Ranking of Indirect Effects
	Summer Pool Shoreline	Winter Pool Drawdown	Tailwater Streambanks						
Base Case	No change	No change	No change	No change	No change	No change	No change	No change	No change
Reservoir Recreation A	Increase	Decrease	Increase	Slight decrease	Adverse	Increase	Increase	Slight decrease	Adverse
Reservoir Recreation B	Increase	Decrease	Increase	Decrease	Slightly adverse	Increase	Increase	Decrease	Adverse
Summer Hydropower	Decrease	Increase	No change	Slight decrease	Slightly beneficial	Decrease	Decrease	Slight decrease	Slightly beneficial
Equalized Summer/ Winter Flood Risk	Decrease	Increase	No change	Slight decrease	Slightly beneficial	Increase	Decrease	Slight decrease	Slightly beneficial
Commercial Navigation	No change	No change	No change	No change	No change	No change	Slightly increase	No change	No change
Tailwater Recreation	Increase	Decrease	No change	Decrease	Slightly adverse	Increase	Increase	Decrease	Adverse
Tailwater Habitat	Increase	Decrease	Increase	Decrease	Slightly adverse	Increase	Increase	Decrease	Slightly adverse

[1] From rainfall, streamflow, and wave action (wind and recreational boat traffic).

[2] Saturation/drying of archaeological deposits and historic structures in the drawdown. Vandalism/looting and disturbance from recreational activity.

[3] Based on the assumption that all impact concerns are equally important.

[4] See Section 5.15, Shoreline Development and Land Use.

This page intentionally left blank.